REMARKS

Applicants would like to thank the Examiner for the thorough examination of the present application, and for correctly indicating as allowable the subject matter of dependent Claims 8-10 and 24-26. Independent Claims 36 and 45 have been amended to avoid claim duplication with respect to independent Claims 1 and 17. The arguments supporting patentability of the claims are presented in detail below.

I. The Claims are Patentable

Independent Claims 1, 17, 36 and 41 have been rejected over the Chow et al. patent in view of the Tzannes et al., the Spruyt et al. patent and the Verbueken patent. The present invention, as recited in independent Claim 1, for example, is directed to a multi-carrier transmission system comprising a first and a second transceiver, with each transceiver having a receiver and a transmitter. Data is transmitted between the transceivers by modulating the data onto a multiplicity of carrier waves in the form of multi-bit symbols. Each carrier wave constitutes a channel, and the number of bits per symbol (i.e., the bit loading) varies between channels, and within a channel, with time, so that each channel has associated therewith a bit loading parameter.

In operation, the multi-carrier system is adapted to synchronously update, at the first and second transceivers, the bit loading parameters associated with each channel by transmission of data over a control channel. The control channel is established, at system start-up, on a predetermined one of

the multiplicity of carrier waves whose identity is known to the first and second transceivers. The control channel is, after start-up, changed from the predetermined channel to a further channel, selected by the first transceiver on the basis of channel characteristics. The present invention advantageously maintains synchronization between two transceivers during dynamic system reconfiguration of bit loading factors.

Independent method Claim 17 is similar to independent device Claim 1. Independent device Claim 36 is similar to independent device Claim 1 except it has been amended so that it does not recite that the number of bits per symbol varies "between the channels and, within a channel, with time." In addition, Claim 36 has been amended to remove the recitation that the first transceiver selects the "different channel." Independent method Claim 47 has been amended similar to independent device Claim 36.

Referring now to the Chow et al. patent, Chow et al. discloses a multi-channel transmission system in which bit loading parameters are updated. Maximum data throughput is achieved by assigning the total amount of information, or number of bits, to be transmitted in each multicarrier symbol to particular carriers through an initial bit allocation procedure. Initial bit and energy allocation tables are calculated at the receiver. These tables are stored in the receiver as a receive bit allocation table **78** and a receive energy allocation table **80**. These receiver tables are available to a data symbol decoder **72** during normal continuous system operation, as illustrated in FIG. 14. These same tables are also communicated

back to the transmitter and stored therein as the transmit bit allocation table **66** and the transmit energy allocation table **68**. These transmitter tables are available to a data symbol encoder **64** during normal continuous system operation, as illustrated in FIG. 13.

As correctly noted by the Examiner, Chow et al. fails to disclose that control channels are used for transmitting data to update the bit loading parameters, and consequently, a control channel is not changed to a different control channel after start-up on the basis of the channel characteristics, as recited in independent Claim 1.

The Examiner cited the Tzannes et al. patent as disclosing a control channel to transmit data for updating bit loading parameters. In particular, reference is directed to column 4, lines 51-67 of Tzannes et al., which provides:

> "In FIG. 1, a transmitter **10** for use in asymmetric data subscriber loop (ADSL) communications has first and second bit allocation tables **12** and **14** for use in assigning data to a plurality of channels for transmission to a remote receiver **16** which has corresponding bit allocation tables **20** and **22**. The tables operate in pairs under control of a table switch unit **28** at the transmitter. In accordance with ADSL practice, a digital signal s(t) to be transmitted to a receiver is distributed over a plurality of channels f_1, f_2, . . . f_j, in accordance with channel allocation assignments stored in the bit allocation tables. In particular, the tables B[j] define, for

> each channel j, the number of bits that can reliably be transmitted over a particular channel at a given bit error rate at the specific signal to noise ratio measured for that channel. These tables are determined as described in detail herein, and may vary from time to time during the course of a transmission." (Emphasis added.)

The bit allocation tables in Tzannes et al. are thus used to transmit data to update bit loading parameters. Moreover, these bit allocation tables are changed based upon the channel characteristics, i.e., the bit error rate at a specific signal-to-noise ratio for that channel.

The Examiner cited the Spruyt et al. patent as disclosing the use of a pilot carrier (i.e., a control channel) for transmitting control channel data. The data elements modulated on the pilot carrier are operation data channel elements or overhead control channel data elements, such as data elements used for maintenance or indicating a modification of the number of bits modulated on a carrier of the at least one carrier. (Column 5, lines 31-36.)

The Examiner also cited the Verbueken patent as disclosing the changing of a pilot carrier to a different frequency (i.e., a different channel) based on channel characteristics (e.g., signal-to-noise ratio). Reference is directed to column 1, lines 46-54 of Verbueken, which provides:

> "According to the invention, this object is achieved by determining noise on each carrier in the set of carriers

> at initialization of said system; selecting, by means of a predetermined noise criterion to be fulfilled, said pilot carrier within said set of carriers; repetitively determining noise on each said carrier during normal operation of said system; and selecting another pilot carrier within said set of carriers whenever said predetermined noise criterion is no longer fulfilled by said pilot carrier." (Emphasis added.)

The Examiner has taken the position that it would have been obvious to use a dedicated control channel for transmitting data to update the bit loading parameters in the Chow et al. patent based upon the Tzannes et al. patent, the Spruyt et al. patent and the Verbueken patent as discussed above. In addition, the Examiner has taken the position that it would have been obvious to include the feature of changing the control channel (in Chow et al.) based on channel characteristics in view of Tzannes et al. for increasing the likelihood that control data is accurately received.

Applicants respectfully disagree and assert that there is no proper motivation to modify the Chow et al. patent in the manner set forth by the Examiner. Absent the Applicants' disclosure, one of ordinary skill in the art would not look to modify the multi-carrier system as disclosed in Chow et al. to include a control channel for updating the bit loading parameters, and then change the control channel to a further control channel after start-up based upon characteristics of the channel.

In Tzannes et al., updates to the bit allocation tables (which include the bit loading parameters) are transmitted over a control channel. However, Tzannes et al. fails to disclose that the control channel, after start-up, changes to a further control channel based upon channel characteristics.

In Spruyt et al., a pilot carrier is used for transmitting control channel data, such as data elements used for indicating a modification of the number of bits modulated on a carrier. However, the control channel is an embedded control channel that also does not change based upon characteristics of the channel. (Column 5, lines 37-46.)

In Verbueken, a pilot carrier (i.e., a control channel) is changed to a different frequency (i.e., a different channel) based on channel characteristics. Even though the pilot carrier in Verbueken is used for synchronization between two transceivers, Verbueken fails to disclose that the pilot carrier also functions as a control channel for providing the bit loading parameters associated with each channel.

Applicants assert that only in hindsight, and having the benefit of the Applicants' disclosure, would the skilled artisan possibly be motivated to modify the Chow et al. patent in view of the Tzannes et al. patent, the Spruyt et al. patent and the Verbueken patent. In other words, one skill in the art would not look to modify the multi-carrier system in Chow et al. absent having the benefit of studying the Applicants' disclosure.

Therefore, the Applicants submit that independent Claim 1 is patentable over the Chow et al. patent in view of the Tzannes et al. patent, the Spruyt et al. patent and the Verbueken patent. Independent Claims 17, 36 and 41 are similar to independent Claim 1. It is also submitted that independent Claims 17, 36 and 41 are patentable over the Chow et al. patent in view of the Tzannes et al. patent, the Spruyt et al. patent and the Verbueken patent. In view of the patentability of independent Claims 1, 17, 36 and 41, it is submitted that their dependent claims, which recite yet further distinguishing features are also patentable over the cited references. Accordingly, these dependent claims require no further discussion herein.

CONCLUSION

In view of the amendments to the claims and the arguments provided herein, it is submitted that all the claims are patentable. Accordingly, a Notice of Allowance is requested in due course. Should any minor informalities need to be addressed, the Examiner is encouraged to contact the undersigned attorney at the telephone number listed below.

Respectfully submitted,

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